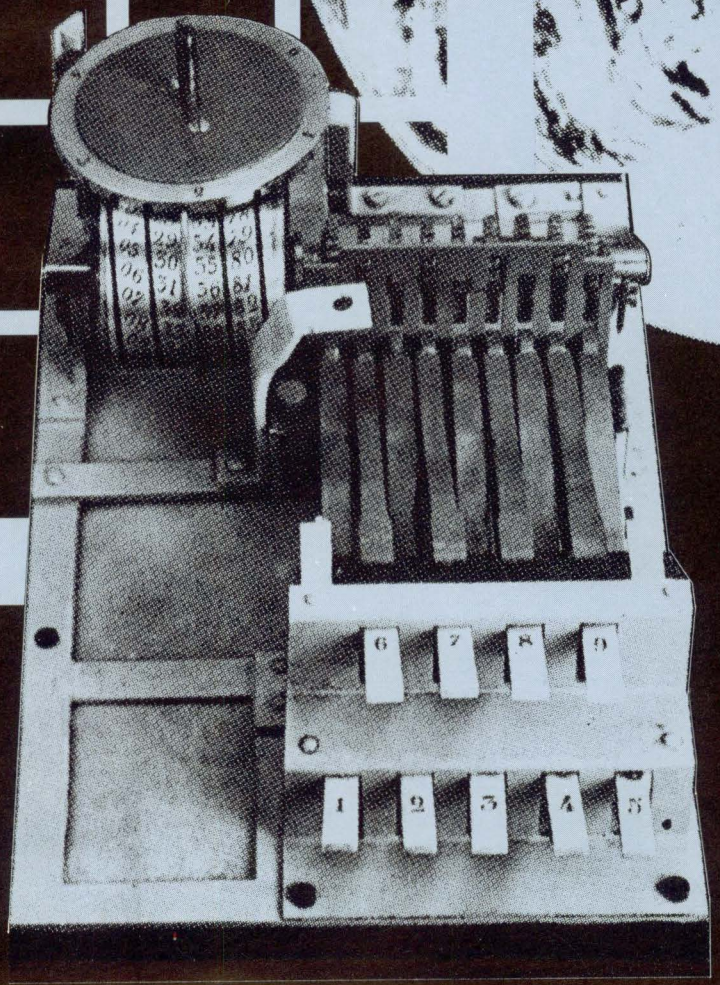
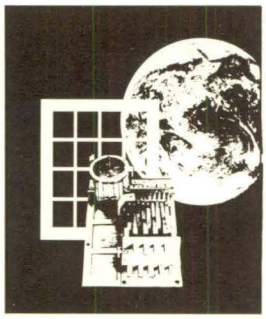
Fall 1987

ITEMS

UNIVERSITY OF MINNESOTA
INSTITUTE OF TECHNOLOGY





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Features

Departments

ITEMS

University of Minnesota
Institute of Technology

Fall 1987

Items is published three times a year to inform Institute of Technology alumni and friends about news, interesting alumni and faculty, and relevant issues. Letters to the editor, requests to receive *Items,* and notices of address changes should be sent to the Director of Development, Institute of Technology, 107 Walter Library, 117 Pleasant St. S.E., University of Minnesota, Minneapolis, MN 55455. *Items* welcomes letters and ideas from all readers.

This issue was prepared with the assistance of University Relations.

Correction

Hewlett-Packard Company was spelled incorrectly in the 1986 Spring-Summer issue of *Items.* I

NEWS

Fine endows theoretical physics institute

University alumnus and Minneapolis lawyer and real estate developer William Fine has given $1 million to establish an Institute for Theoretical Physics in IT. The new institute will be one of only three such centers in the U.S.

With matching funds from the Permanent University Fund and Fine's pledge for an additional $1 million over the next several years, financial support for the institute totals at least $4 million.

The gift will help the physics department improve its ranking by making it possible to both hire and host visits from some of the world's finest theoretical physicists. "We're going to try to hire people who will get the Nobel Prize after they're here," says department head Marvin Marshak. I

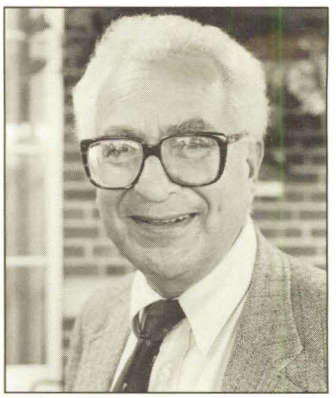
Gibson gift funds chair

A $1 million donation from George and Orpha Gibson, Midland, Texas, will establish a hydrogeology chair in the Department of Geology and Geophysics, increasing the department's status as a leader in water quality and management research. The donation will be matched by the Permanent University Fund. A search is under way to fill the chair.

George Gibson received two degrees in geology from the University—a bachelor's in 1930 and a Ph.D. in 1934. As a star football player for the Gophers, he was team captain and an All-American guard in 1928. He taught at the University, Carleton College, and Ohio State University and

worked for oil companies in the U.S. and abroad. Since 1957 he has been a geological consultant in Texas. A language specialist fluent in German, French, and Norwegian, Orpha Gibson studied at Midland Junior College and Yale University. I

Off to a fresh start this fall, this issue of *Items* underwent a redesign of its look. We hope to make it easier for readers to find the news and features they enjoy. In addition, we've established a new production schedule. *Items* will be published three times during the school year in fall, winter, and spring. As always, we welcome your comments about the issue and encourage you to fill out and send in an alumni update form (on page 15). I



Murray Gell-Mann

Murray Gell-Mann, winner of the 1969 Nobel Prize in physics for his work on the theory of elementary particles, delivered the fifth annual Abigail and John Van Vleck

Lecture in April. His speech addressed the question: Is everything in the universe composed of superstrings?

Robert Kowalski, head of the Logic Programming Group at Imperial College, was the featured speaker at this year's Cray Endowed Lectureship in Computer Science in April. He talked about computer logic and human reasoning. I

The mechanical engineering department's Student Advising and Information Center has been dedicated and named in honor of its founder, William A. Kleinhenz. Kleinhenz was a mechanical engineering faculty member until his death in 1985. He established the student advising center in 1977 and was associate head of the department for 23 years. I

ALUMNI NEWS

Borchardt & Rowe receive Outstanding Achievement Awards

Two IT graduates have received Outstanding Achievement Awards, the highest honor the University gives to its alumni.

Lester F. Borchardt, former corporate vice president and research director at General Mills, received a bachelor of electrical engineering degree from the University. He was considered instrumental in helping the company develop from essentially a flour-milling operation to a worldwide distributor of packaged foods. His patented innovations in food packaging, milling, and processing revolutionized many areas of the food industry.

Jack Rowe, chief executive officer of Minnesota Power and Light, serves on the Minnesota High Technology Council and is an advisory member of the School of Business and Economics on the University's Duluth campus. He also is a graduate of the University's electrical engineering department. To recognize his achievements, the first endowed faculty chair at the Duluth campus will be named the Jack F. Rowe Chair of Engineering. Minnesota Power and Light contributed $750,000 to establish the chair. I

Memorial scholarship honors Isaacs

A memorial scholarship honoring Alvin Simon Isaacs has been established for civil and mineral engineering students who need financial assistance.

Isaacs alternated each year of his civil engineering studies at the University with a year as a seaman on cargo ships. He earned a first mate's license in the U.S. Merchant Marine and served in Hawaii during World War II. The Army later promoted him to the rank of major.

After the war, he completed his civil engineering degree at the University of Southern California and eventually became an independent structural design consulting engineer. He later traveled and taught around the world. He died in 1975.

"That a scholarship fund has been created in his name would have greatly surprised him," says his brother, Charles Isaacs. "Once used to the idea, though, he would hope the recipients might have some of his own sense of self-creation, dedication, integrity, desire to keep learning, and above all, joy in the adventure of living." I

FACULTY

Agricultural Engineering

Professor *Harold Cloud* has received the 1986 Red River Valley Potato Growers Association meritorious service award. Professor *Roger Machmeier* has received awards from the Minnesota chapter of the Soil Conservation Society of America and the Minnesota On-Site Sewage Treatment Contractors Association.

Architecture

Professor *Leonard Parker* has received the Minnesota Society of the American Institute of Architects' most prestigious award, the Gold Medal.

Chemical Engineering and Materials Science

Professor *Edward Cussler* received the 1987 George Taylor/IT Alumni Society Award for Teaching. *Klavs Jensen,* associate professor, received a 1987 Guggenheim fellowship. *Richard A. Oriani,* professor and director of the Corrosion Research Center, has been awarded the W.R. Whitney prize by the National Association of Corrosion Engineers.

Chemistry

Professor *Paul Gassman* is the Council for Chemical Research board of governors' chairman. He also received the 1987 George Taylor Award for Service. Professor *Wayland E. Noland* has been elected a fellow of the American Association for the Advancement of Science. Professor *Donald Truhlar* has been elected a fellow of the American Physical Society.

Civil and Mineral Engineering

Peter Kitanidis, associate professor, has been named associate editor of *Water Resources Research. Heinz Stefan,* professor and associate director of the St. Anthony Falls Hydraulic Laboratory, has been made a correspondent member of the Chinese Hydraulic Engineering Society.

Computer Science

Maria L. Gini, assistant professor, received a 1987 Horace T. Morse-Amoco Award for Outstanding Contributions to Undergraduate Education.

Electrical Engineering

Professor *Pramod Khargonekar* received the 1987 George Taylor Award for Research.

Geology and Geophysics

Herbert E. Wright, Jr., regents' professor of geology and geophysics and director of the Limnological Research Center, has been awarded an honorary Ph.D. by the University of Lund, Sweden.

History of Science and Technology

Program coordinator *Roger Stuewer* has been elected vice chairman of the American Physical Society's history of physics division.

Mechanical Engineering

Richard Goldstein, professor and department head, has been elected president of the Assembly for International Heat Transfer Conferences for four years. *Benjamin Liu,* professor and director of the Particle Technology Laboratory, has been elected to the National Academy of Engineering, elected president of the American Association for Aerosol Research, and appointed as a delegate to the International Aerosol Research Assembly.

Physics and Astronomy

Professor *Walter Johnson* received a 1987 Horace T. Morse-Amoco Award for Outstanding Contributions to Undergraduate Education. I

Computer Technology From One ERA to Another

Minnesota helped lead a revolution and looks forward to another

The year was 1946. Like many others in postwar America, Minnesota's first digital computer company, Engineering Research Associates Inc. (ERA), began its existence with small, shaky steps. Its 200,000 shares of stock sold for just 10 cents each. Only a line of credit from a few investors and a couple of U.S. Navy contracts kept the wobbly new company on its feet in those early days.

But unlike many of its contemporaries, this company had a future. In fact, this company could almost be said to have been the future.

ERA's founders and staff shared the rare combination of entrepreneurial spirit and teamwork that fosters innovation and enthusiasm. The company specialized in automated systems and magnetic drums for digital data storage. The work trained its engineers and scientists for futures as founders of the more than 100 technology firms that today form the core of Minnesota's high-tech community: Honeywell, Sperry (now a part of Unisys), Control Data, Cray Research, ETA Systems, and many others. ERA's designs provided the basics for product lines that turned those companies into global giants.

ERA's influence reached even further than Minnesota. According to William Norris, a founder of ERA and later of Control Data, the enthusiasm at ERA was a major factor in "helping to build the momentum that propelled the United States into world dominance of the computer industry."

From its tiny beginnings at ERA in 1946, Minnesota's computer-related business employment had exploded to 19,000 in 1967, and then to 40,000 by 1982.

"The impact has just been phenomenal," says John Rollwagen, chairman and CEO of Cray Research Inc. "In 1967, those 19,000 people produced $414 million of value-added revenue. By 1982, that number was almost $2.4 billion, or 16 percent of our total economic [manufacturing] activity."

ERA's first researchers and their successors created a revolution. The pervasiveness and sophistication of today's computers exceeds even their predictions. But now that speed and omnipresence, especially when combined with new developments in artificial intelligence, may have us on the brink of another revolution. The rapid growth potential of computers raises many issues—both new and familiar—for the future.

As recently as 15 years ago, computers were still rather unusual items, sold individually. Now they are sold in batches, by the millions. This rapid change and the influx of new energy derived from the use of computers—according to Gerald G. Probst, former chairman and CEO of Sperry Corp.—"are creating shock waves that are cracking the foundations of things the way they are. It's the enemy of the obsolete. It's the enemy of entrenched ways of doing things. It's the enemy of the status quo."

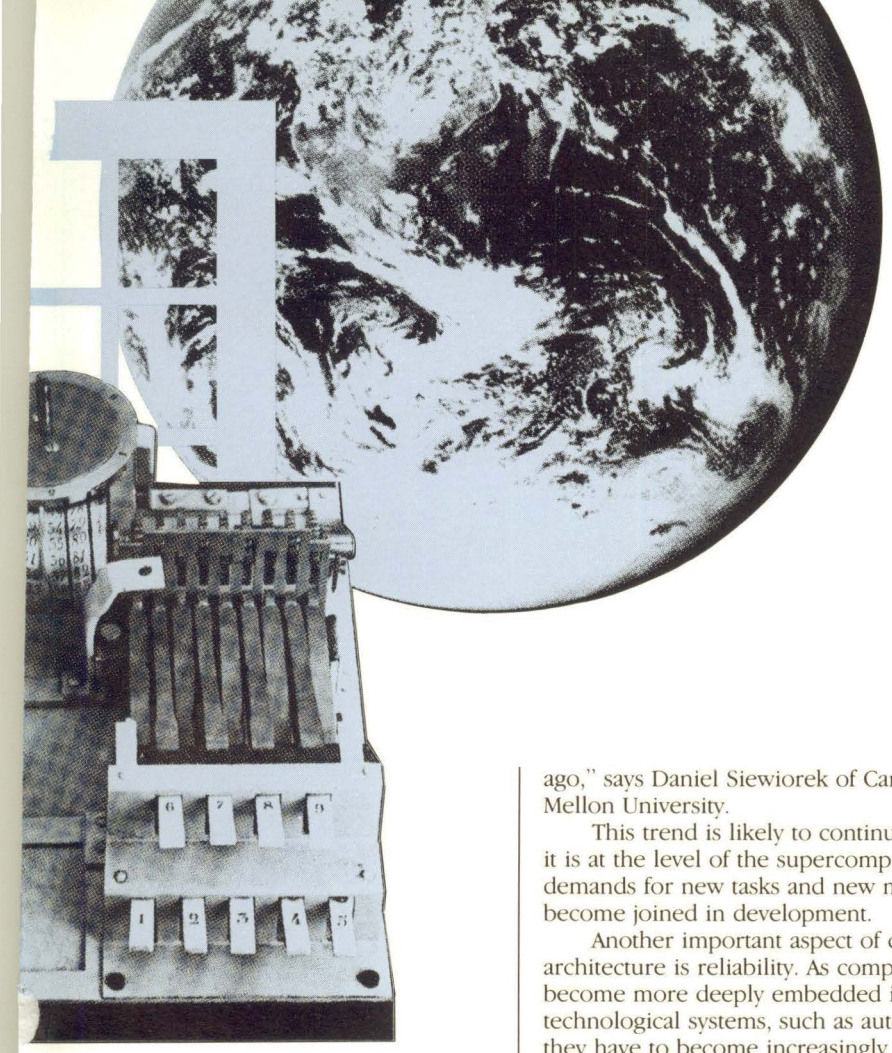
But is it all moving too fast? Donn Parker, a noted analyst from SRI International, says that for all our love of numbers (he says 46 of 47 stories in an edition of a daily paper quoted at least one statistic), most of society today remains "innumerate," unable to compare large and small numbers correctly, estimate things logically, or correctly analyze the myriad of everyday statistics.

This question of pace and growth potential is a newcomer to the list of global issues facing the computer industry. Experts agree: The major impact of computers in people's lives hasn't yet been seen, and new, forward-looking policies must be developed to deal with the coming of this second revolution.

In foreign and economic policy today, national economies are fragmented, no longer dependent on just a few major industries. Geographic borders are less relevant. Success in any business will depend strongly on information and information technology.

"We focus on the present form of foreign competition, and I think it's terribly important to realize that what we're going to be dealing with will be a changing form of foreign competition," says John Diebold, chairman and founder of the Diebold Group.

Diebold agrees with Secretary of State George Shultz that the boom in information technology will almost surely have an effect on the East/West power balance. Americans need to recognize what tomorrow will be like and "to design our competition and our own ability to compete in relation to that," Diebold says. "It means a very big departure from some of the practices of the past. It means an agility to move rapidly. It means a great



By Arthur L. Norberg

deal of hard work."

Computer technology also may alter world politics. Computers are a product of an open society, and naturally allow and encourage the free exchange of information, says Gerald Probst. The introduction and increasing use of computers in Third World nations will provide a tool that will inevitably open closed societies, he argues.

As for computers themselves, change continues, too. Major developments will likely occur in three areas: architecture, software, and microminiaturization.

As computer designs and applications have developed over the years, so have the range of needs and opportunities for their use. Many architectural developments first seen in supercomputers filter down gradually into lower-level machines. "If I want to find out what's happening in minicomputers now, I look to see what happened in supercomputers five years ago," says Daniel Siewiorek of Carnegie-Mellon University.

This trend is likely to continue, since it is at the level of the supercomputer that demands for new tasks and new machines become joined in development.

Another important aspect of computer architecture is reliability. As computers become more deeply embedded in other technological systems, such as automobiles, they have to become increasingly more fault-free.

And, as always, as users demand greater performance capabilities for new tasks, more and more specific architecture will be developed. For example, new systems will be required to perform both parallel processing techniques and sequential tasks.

Of course, all projections for computers and their use rest on software development as well as architecture. Specific applications are limited in reality only by software engineering. Even today, there is often a big gap between the peak rate potential of a system and a user's actual results. Says Lloyd Thorndyke, president of ETA Systems Inc., "Our most pressing need is the development of software technology to capitalize on our hardware capabilities."

"Think small" has been the watchword of the industry for years. Perhaps one of the most striking developments in information technology has been the simultaneous reduction in the size of solid state elements (such as microprocessors) and in the unit cost of their components. Things have been getting both cheaper and more powerful as they get smaller (a 256K microprocessor is much smaller than a 4K, for example).

But even though the size of microprocessors has decreased as their capacity has increased, the basic technology has never really changed in any other way...and therein may lie a problem.

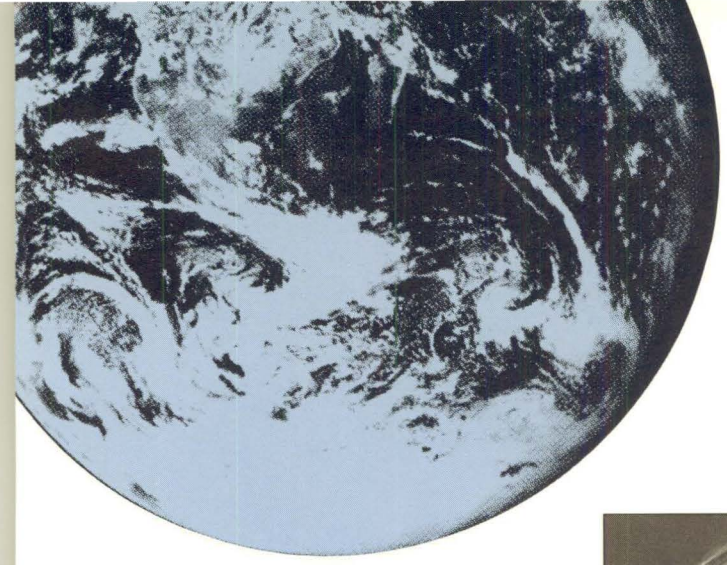
Current small transistors measure about one micron in thickness. By contrast, a fingernail is approximately 10,000 microns thick. Dennis Buss, a vice president of Texas Instruments, predicts things can't go much further—the half micron will be the limit of current technology. He calls it "the half-micron apocalypse."

Most of society remains "innumerate," unable to compare large and small numbers correctly, estimate things logically, or correctly analyze the myriad of everyday statistics.

If things get smaller than a half micron, says Buss, there will be problems with thermodynamic noise limits, with quantum limits based on the Heisenberg uncertainty principle, and with the fact that in the half-micron range, classical electron transport physics no longer applies.

One solution to the "apocalypse" could lie in electron resonance tunneling, in which erasing a bit from memory would require only an increase or decrease in voltage to transfer it from one quantum state to another. The new state would be the new information—much the same process as the magnetization of tape in other types of memory systems.

However it's done, breaking the half-micron barrier will require a whole new technology. Its development, in turn, will require large new research and development costs, added manufacturing costs, and a new start in the areas of performance and reliability.



Keeping up with the changes and using them in innovative ways will, of course, be the biggest challenge of all. And communication and cooperation will be crucial for success.

"The most productive, affordable, and readily available opportunity to expand innovation and substantially increase the efficiency of research, development, and manufacturing is through public/private technological cooperation," says William Norris.

He referred to several organizations now helping with this necessary task:

- The Microelectronics and Computer Technology Corp. (MCC), an inter-industry effort to develop base technologies for use by member companies in microelectronics and computing.
- The Job Creation Network, a government/industry effort consisting of a cooperation office, a seed money fund, and a business/technology center, all aimed at helping create small businesses.
- The Midwest Technology Development Institute (MTDI), which has three objectives: to expand technological cooperation among industries and universities, to increase the efficiency of research and the commercialization of results, and to provide a mechanism to make technology more available to industry and improve its flow between the Midwest and foreign countries.

There are also additional resources at the University of Minnesota: the Institute of Technology's Supercomputer Center and Institute, and the Microelectronics and Information Sciences Center, which aim to help bring the latest research into industry and thus into the marketplace.

ERA Inc. ushered the first wave of the information revolution into Minnesota. Now, just 41 years later, the industry is leading us into the second wave, and the future is both exciting and ominous.

"Over the past 40 years, we have laid a foundation for sustained growth by developing an infrastructure of technology, educating two generations about computers, and applying the power of these resources," says Lloyd Thorndyke. "During the next 40 years, we face the challenges of properly directing and harnessing the accelerating capacity of computer technology into productive channels. None of this will come without diligent effort, but the rewards will make moving the frontiers worthwhile." I

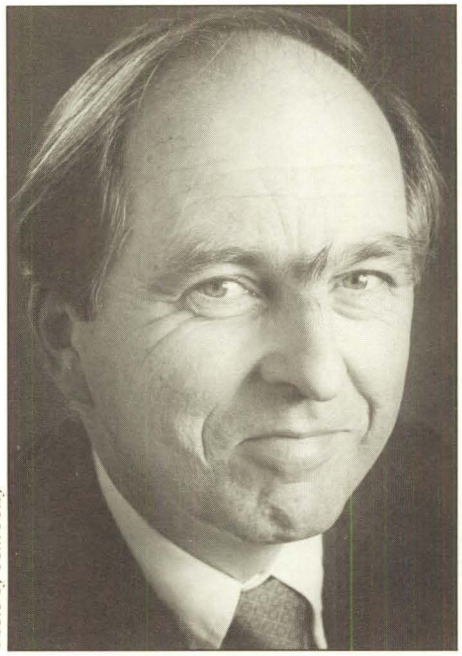


Photo by Tom Foley

Arthur L. Norberg

Arthur L. Norberg is director of the Charles Babbage Institute for the History of Information Processing. Ideas and comments contained in this article were presented at "Computing in the Twenty-First Century," a symposium celebrating innovation in computer technology, sponsored by the Charles Babbage Institute in September 1986.

The Future of Computer History

Erwin Tomash, a St. Paul native who founded Dataproducts Corp., a Los Angeles computer peripherals manufacturer, thought people needed to understand the impact of computers on their lives. The explosion of the computer industry was a phenomenon that deserved to be documented and studied, Tomash believed.

With industry backing of $250,000 from such companies as AT&T, Honeywell, IBM, and the American Federation of Information Processing Societies, he helped create the Charles Babbage Institute for the History of Information Processing (CBI). In competition with 12 other major universities, the University of Minnesota won the opportunity to house the Babbage Institute in 1980. CBI is now an academic research unit of the Institute of Technology.

The Babbage Institute is named after Charles Babbage, a 19th-century mathematician who dreamed up a steam-driven calculating machine incorporating most of the principles used in today's modern computers. Although his machine lacked financial backing and was never built, Babbage today is often referred to as the father of computing.

Under the direction of associate professor Arthur L. Norberg, the Babbage Institute focuses both on technical history and on financial, legal, and government factors that have shaped and changed the computer industry. The institute's four specific tasks are to catalog and maintain an archive of documents, to prepare and conduct interviews with industry figures, to act as a clearinghouse for research inquiries, and to engage in historical research projects.

According to Norberg, the industry's short history provides a unique opportunity for study—one of the first opportunities ever to document a major social revolution as it happens. Many key figures are still alive, and history is still occurring in our own time. I

A Deep, Dark Field Trip

Alumnus remembers work in the mines

By Miriam Feldman

In the picture, Harley Schneider sits on the ground, legs crossed, in front of the Inland Steel Mine No. 1, on the Cuyuna Iron Range in Crosby, Minn. He wears a serious expression and sports a miner's hat, the kind with a lamp on the front. No doubt, he's coated with red dust from the iron ore. Although that detail eluded the camera, it remains indelibly printed in Schneider's memory, even today.

The photo of Schneider and his classmates (reproduced on this page) was taken sometime in the spring of 1929, during a School of Mines surveying field trip.

The students only entered the mines after the miners had come up. But frequently the miners continued to work above ground, blasting rock, while the students were underground.

"They'd blast, and we'd be coated with all the powder dust from the blasting," Schneider says. "Within a day or so your clothes were red, and they remained red for the rest of the trip."

Schneider also recalls the close call he had while wearing his miner's hat. Tromping through a wet mine one day, the students walked by mine cars, which were operated by an overhead electric cable. They had been instructed to keep their heads low, but Schneider failed to heed the warning. "I put my head up, and all of a sudden there was a spark, and I felt like someone had knocked me hard." After that, Schneider remembered to keep his head down, and remembers it to this day.

It was the lure of faraway places that attracted Harley Schneider to mining. "In those days, we were in the School of Mines. That was a separate school." (Undergraduates today can choose from degree programs in civil engineering, extractive metallurgical engineering, geo-engineering, and those in related fields, such as chemical engineering.)

Photo by Harley R. Schneider

The faces of mining students during the 1929 School of Mines sophomore surveying field trip. Some identities are uncertain, as indicated by question marks. If you recognize any of these people, please contact Harley Schneider. First row (sitting from left to right), Joe P. Sullivan, Floyd W. Erickson (?), Olaf T. Berge (?), Harold F. Johnson (?), Robert Calton, Harley R. Schneider, Arthur M. Nelson, and Nicholas Kurzeck. Second row (kneeling from left to right), Ben F. Penrose (?), David H. Smith (?), Ralph L. Groezinger, Marvin E. Johnson (?), Adolph G. Gunelson (?), and Donald F. Fischer. Top row (standing from left to right), Bennett P. Nylene (?), unidentified student, Arnold C. Dahl (?), Warren Togo Erickson, (professor) Edwin M. Lambert, Robert W. Geehan, Raymond C. Trueman (?), Tully P. Sanders, (instructor) Stanley A. Trengove, Glen W. Anderson, and James E. Hill.

"Mining had meant going to exotic places. Arabia. That Middle East oil," Schneider says. But the Depression interfered with his plans. In 1933, when he graduated, jobs were hard to find, so Schneider settled in his home town of New Ulm, where he found occasional work for 35 cents an hour.

Soon, however, Schneider's skills as an engineer were in demand, as Franklin Roosevelt's economic recovery programs began. Appointed an area engineer for his county, he supervised the construction of numerous Works Progress Administration (WPA) projects in the New Ulm area, including water mains, sewers, community buildings, swimming pools, a football stadium, a city garage, bridges, and roads.

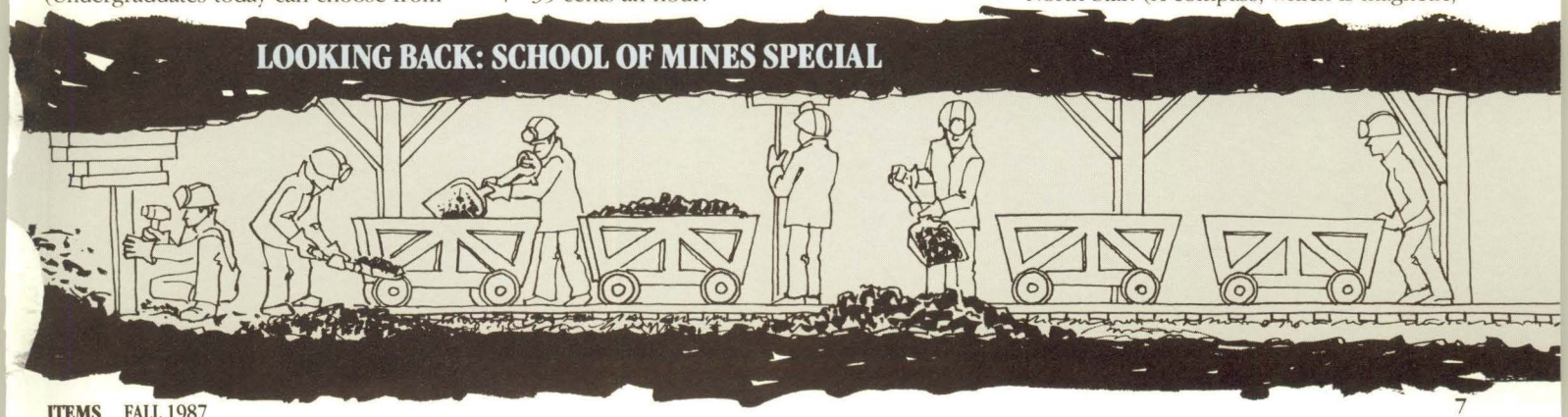
Events may have altered Schneider's plans, but they couldn't affect his basic training. The rigorous education he and the other mining students received during those seven weeks in Crosby prepared him for many engineering tasks. In Crosby, Schneider and the other sophomores practiced the art of surveying, both above ground and underground.

The students stayed at the Spaulding Hotel in Crosby, but as Schneider tells it, they didn't spend much time there. The days began early and often ended late at night, after the students attended evening classes or practiced reading the night sky.

In the mornings, the students learned to calibrate their instruments. "The professors would put them out of adjustment, and you'd have to put them back," Schneider remembers.

Once the students had mastered handling their instruments, they began to use them. Above ground, in the open pits, they cross-sectioned the land and took elevations, as they tried to figure out how much ore could be extracted from the area.

Students attended evening classes in the local high school. They learned to find true north by waiting for the stars to come out and then searching for Polaris, the North Star. (A compass, which is magnetic,



is useless on the Iron Range, where all of the metal in the region deflects the compass point.) During the day in the mines, they had to get their bearings without the help of the sky.

The students didn't enter the mines until the last three weeks of the trip. Underground, they learned to survey the mines and observe the direction of the drifts to find new pockets of ore. They practiced writing maps based on their findings.

Going down into the mine was an unforgettable experience. "Here was this kid from the prairie, going down under," Schneider says. "We'd put our instruments in cases and climb down 300 feet of ladders." The mine was wet, and he still remembers the "damp smell."

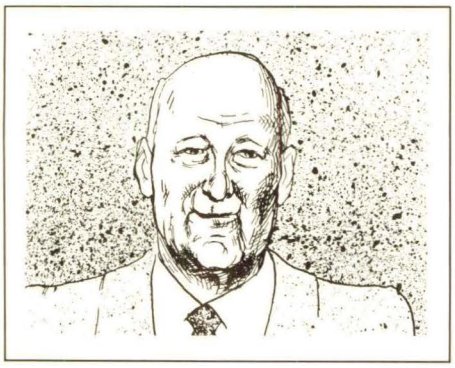
Schneider recalls several underground misadventures. His near brush with electrocution was one. He also remembers the time his tripod, which had a sharp point on one end, fell from his knapsack as he climbed a number of levels (each 50 feet apart) inside the mine. "I was practically up to the top, and that thing fell all the way to the bottom. If someone had been on the bottom, it could have gored him."

Today there are few operating mines. Schneider continues to work, as a land surveyor, in New Ulm. He looks back fondly to his days as a mining student, working the mines in Crosby. "It was an experience you can't imagine." I

Miriam Feldman is a free-lance writer living in Minneapolis.

The '36ers In a Mining Class by Themselves

Six graduates tell the tales of their treks



John Mahle

Professor Lambert of surveying told me during my sophomore year that if I were his son, he would advise me to get into operations rather than engineering since that's where the big money is made. I never forgot his excellent advice, and after almost four years as a petroleum engineer, I made the change that resulted in a very enjoyable career and financial independence.

During my 40-year career with Standard Oil (after that shift from petroleum engineer to rotary helper, derrickman, and driller), I moved from drilling foreman to assistant drilling superintendent and then to superintendent of the northern division, finally spending 10 years as drilling superintendent for Standard's southern division operations in La Habra, Calif.

Since my retirement we have traveled to most parts of the world, accompanied by one or more of our family members. Our most enjoyable cruise was an 84-day around-the-world venture on the Queen Elizabeth II in 1981. I enjoy marlin and other big game fishing, hunting, partying, entertaining friends, and the casinos at Tahoe, Las Vegas, and Reno. In addition, I enjoy an occasional challenging drilling consultant assignment to keep involved in my first love, drilling. I

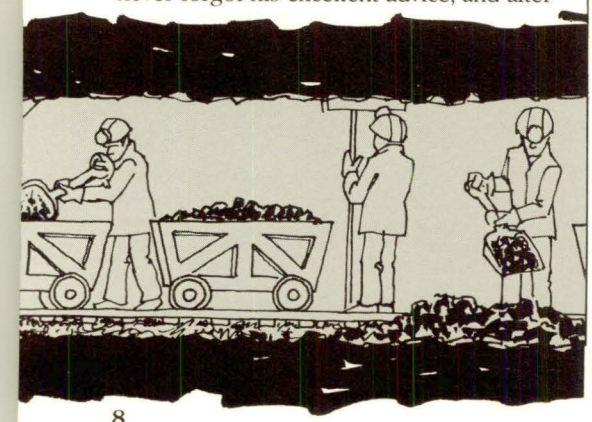


Illustration by Earl Slack

Michael Tenenbaum

After completing his bachelor's degree at the University, he joined Inland Steel Co. in 1936 and earned a master's degree in 1937 and a Ph.D. in 1940 from Harvard. He was Inland's general manager for research and quality control from 1961 to 1966, vice president for research from 1966 to 1968 and for steel manufacturing from 1968 to 1971, president from 1971 to 1978, and director from 1971 to 1984. Northwestern University has presented him with an honorary D.Sc. degree, and his many achievement awards include the Western Society of Engineers' Washington Award in 1976 and the Bessemer Gold Medal Award from the British Society of Metals in 1980. Tenenbaum has published numerous articles in professional journals.

As classmate John Mahle says, "One of my greatest gratifications took place one morning when I glanced at my *Wall Street Journal* and read that Mike Tenenbaum, one of my closest classmates, had been elected president of Inland Steel. I had him on the phone in a matter of minutes to congratulate a truly deserving man." I

Portraits by Matthew Fuller

Bert Andreas

After graduation, I started working for Butler Brothers iron ore mining operations at Cooley, Minn. (not on the map anymore). The following year I transferred to the research department, and then to the engineering department as underground and open pit engineer. I advanced through several levels of engineering to chief engineer and finally mine superintendent.

In 1948 the M.A. Hanna Company purchased Butler Brothers, and I was appointed general superintendent for all the original Butler Brothers mines. Later I advanced to manager of all Minnesota mines. Later still, I became general manager of the iron ores division of the M.A. Hanna Company for mines in Minnesota, Missouri, Wisconsin, Michigan, and Ontario, including five taconite operations.

In 1971 I was transferred to Cleveland, Ohio, as vice president for administration of mines until my retirement in 1975. Upon retirement, Dorothy and I returned to our Swan Lake home in Pengilly, Minn., five miles from the place where I started my career. We celebrated our 50th wedding anniversary last fall and thankfully are still in good health. We have four children and nine grandchildren. I

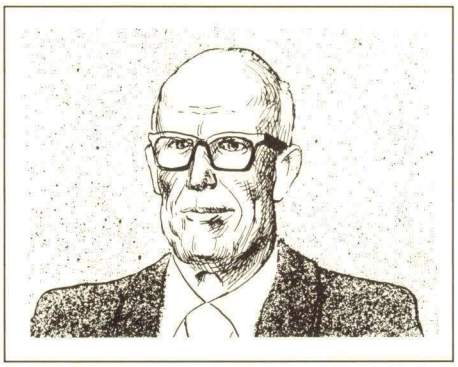
Eugene Stein

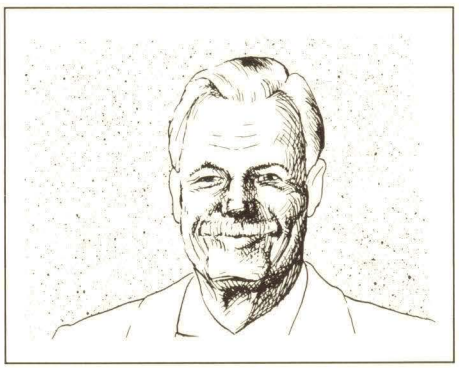
After graduation, I went to work as a research metallurgist for Deere & Company in Moline, Ill. I was involved in various research projects in ferrous metallurgy—primarily gray and malleable iron—and cast and wrought steels.

In 1943 I went to work for Gunite Foundries Corp. in Rockford, Ill., as a research metallurgist. There I worked in ferrous castings research, nodular iron development, and cobalt-60 radiography.

In 1951 I was made senior metallurgist for the Battelle Institute in Columbus, Ohio. My research projects involved cast and wrought metals, alloy development, powder metallurgy, and high-velocity compaction of powders. I retired in 1975 but continued part-time consulting for Battelle until 1980.

In 1940 I married Anna Karnoff of New York City; we have two sons. I am currently active in tennis, golf, bowling, chess, violin, fishing, and travel. I





John Lynn

Following graduation, I went to work for Republic Steel Corporation in Canton, Ohio, investigating corrosion problems of stainless alloy products in the laboratory. In 1937 I married Olga Kuchynka of Minneapolis, and in 1939 we moved from Canton to Baltimore, Md., where I was a metallurgist at Rustless Iron and Steel (now a division of Armco) and had assignments in alloy development, quality control, and machinability research. Our two children were born in Baltimore.

In 1947 I went to work in the materials and processes laboratory of North American Aviation Inc. (now Rockwell International) and was involved with the B-45, the FJ-1, a series of F-86's, the F-100, and the X-15.

Subsequently I had assignments at Rocketdyne (components for Atlas, J-2, and F-1 rocket engines) and Atomics International (nuclear energy, components for the experimental breeder reactor at Idaho Falls, and the fast flux test facility at Huntsville, Ala.). Sandwiched into all that were four most interesting years as metallurgist at Paper Mate Pen Company, a division of Gillette.

In 1975 with our children raising their families in Los Angeles and Seattle, Wash., I retired, and Olga and I moved to a home on an acre in the village of Fallbrook, Calif., 120 miles south of Los Angeles.

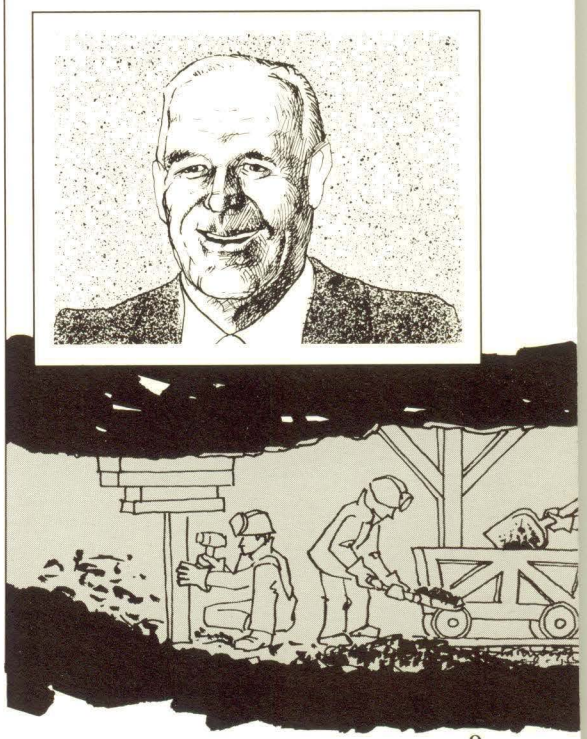
Each of my employment sites has offered a most interesting challenge, a chance to grow. Life has been very good to both Olga and me. I

Chuck Sampson

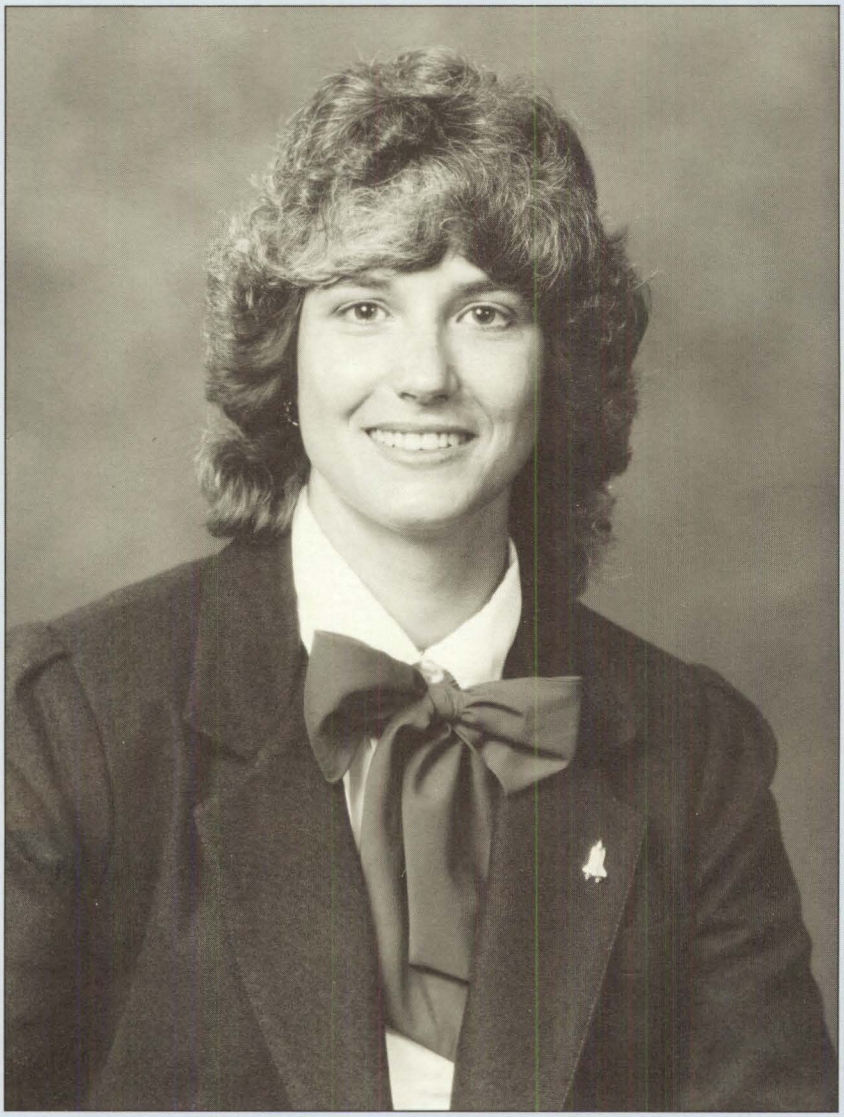
After graduation, I joined Freeport Sulphur Co. at Freeport, Texas, as a field engineer, later becoming superintendent of production at the Hoskins Mound Mine. I moved to Port Sulphur, La., in 1951 and became general manager of several new mines during their development.

A second "career-within-a-career" started in 1956 when I joined Freeport Oil Co. in New Orleans, becoming vice president for production. During this period, we shared development of the large Lake Washington field and drilling of the world's deepest (at that time) oil and gas well—just over 21,000 feet.

Still a third career developed in 1960, when I entered the mineral exploration field. Stationed in New York, I conducted exploration and became vice president of Freeport Exploration Co., Freeport Canadian Exploration Co., Freeport of Australia, Compania Pegaso, S.A., Mexico, and Freeport Zinc Co. Returning to New Orleans in 1971, I continued in exploration and development until I retired in 1978. Margaret Jerome of Minneapolis and I married in 1941. Our three children, all now grown and married, are scattered over the U.S. I



Feet on the Ground, Eyes in the Skies



When astronauts call from space, alum Michele Brekke may answer

By Nancy Lewis

A clear blue sky. The rocket engines blazing a straight path to the stars. And then the explosion. Crazy twirls of white smoke and random pieces of debris falling to earth. The image is etched forever in the minds of most Americans.

But for Michele Brekke, the explosion of the space shuttle Challenger was more than just a picture. In January 1986 she was in a NASA training program to become a flight director for future space shuttle missions. If it wasn't for her personal drive, the image in the sky might have spelled the end of a lifelong dream.

Michele Brekke has been looking at the sky for a long time. It started when her father would take her as a little girl to watch planes take off and land at the Rochester, N.Y., airport.

When she was 16, the first men landed on the moon, and again she looked at the sky. "There are actually people up there right now," she marveled. And this time, her awe was followed by a decision: "I'll do that someday, be an astronaut."

When it came time for college, Brekke chose the aerospace engineering program at the University of Minnesota. "I just fell in love with the place," she says. "I never even visited any other campus."

She graduated in 1975 and suddenly found herself faced with the question of what to do next. She decided to stay in Minnesota, partly because she found part-time work as a computer programmer with Honeywell, partly because she wanted to begin her master's program at the University, and partly because she was dating another IT student, Bob Brekke, who wasn't scheduled to graduate until the following year.

Michele and Bob married in 1976, the year he graduated. By then, Michele also had learned something about herself: "I knew I didn't want to be a computer programmer. I wanted to be the person who needed a computer programmer." The dream of becoming an astronaut was still alive.

Brekke completed her master's degree in 1977 and, "almost as if it had been planned this way," NASA created its first mission specialist positions for space shuttle flights that same spring.

Soon after graduation, Brekke received a phone call from NASA's Flight Training Division, inviting her to come work for the organization as an astronaut instructor. "Yes," they said, "it should improve your chances of becoming an astronaut."

They offered her husband a job too, as an electrical engineer with the shuttle mission simulator project at the Johnson Space Center.

And so two lifelong northerners set out for the hot Texas sun. (Brekke says that now, after nine years, she and her husband have finally acclimated, but that she still misses winter and snow.)

Brekke's job involved training astronauts to operate the shuttle's various guidance, navigation, and flight control systems. To her surprise, she found she liked working on the ground. And so she was disappointed, but not devastated, when after only a month on the job, her own application to the astronaut program was rejected. "I'm a realist," she says. "I know things change. But it would have been much harder to take before I was established in a job I already loved so much."

Brekke continued as an instructor for five years and then moved to a position as a payload officer in Mission Control. For three years she acted as a liaison between Mission Control and the customers who paid NASA to have their satellites and other cargo taken into space on the shuttle.

To build a program from a 50-pound stack of paperwork to a completed shuttle mission... that's the greatest achievement I know.

To the former aspiring astronaut, her new position was even more exciting than the old one. And there were unexpected rewards, too. "I became aware that my career is really on the ground," she says. "I have challenging and stimulating work, but, unlike the astronauts, I can go home to my family at five o'clock."

By this time, "family" included sons Joey and Jeffrey, now five and three years old. According to Brekke, she has "the best of both worlds, without giving anything up. When I go to work, I'm going to something that is truly mine alone. When I come home, I know I now belong to my family—until I go back to work."

In 1983, Brekke's husband, Bob, left NASA for a position at Ford Aerospace. His new job involves applying a mixture of artificial intelligence techniques to complex problems of scheduling and budgeting changes for NASA's data processing systems.

In 1985, Michele Brekke got her biggest break yet. She joined a 12-month training program to become a flight director for NASA's shuttle missions. The flight director plans and directs the mission from Mission Control and supervises the team of more than 50 engineers who monitor the shuttle's systems during a flight.

For Brekke, it seemed the culmination of her dream. "To build a program from a 50-pound stack of paperwork to a completed shuttle mission...that's the greatest achievement I know," she says.

Again, fate seemed to be generous with the achievements. In May of that same year, Brekke was named one of America's 100 outstanding young women by *Good Housekeeping* magazine.

But, then, in January 1986, the Challenger went down.

"I knew January was a watershed period, a turning point for the whole program," she says. "Would we ever fly again? Would I even have a job?"

It was a tough period, she says, but old dreams do not die easily. She returned to the training program.

"I always needed a goal," she says. "So I put that original one-year target date back into the slot to have something to shoot for...I needed a goal to work toward to make things real again."

Brekke completed her training in fall 1986, right on schedule. And, eventually, word came that the shuttle would fly again, with a mission planned for 1988.

Now 34, Brekke says, "We're just taking it one day at a time. We conduct seven-hour integrated flight simulations twice a week. Mission Control staff go into position, and the astronauts take up their positions in the simulator. We treat it as if it were a real flight, and the instructors introduce malfunctions we must respond to.

"Then we spend the rest of the week reviewing all our flight manuals, evaluating and polishing each and every procedure. We've accrued a lot of experience during our 24 successful missions, and it's time to factor it into procedure instead of letting all that knowledge stack up on NASA desks."

Currently, Brekke is working on becoming a rendezvous expert, skilled in guiding a shuttle to a meeting with an orbiting satellite or space station.

And so, after many years, Michele Brekke is still looking at the sky. Surprisingly, she says that her fundamental philosophy comes not from the heavens, but from another love: volleyball.

"When my first coach took me aside and taught me to serve, I learned my body must be in the proper position if I am to be able to control ball placement. And so volleyball taught me that the outcome of whatever adventure you undertake depends on your going in in position. I always go at things with my feet in the forward position and with a positive attitude." A good way to reach the sky, no doubt. I

Super Sleuths Handle Requests for Information

By Miriam Feldman

Donna Rubens recalls the time she had to track down class schedules "from a college located in the boondocks, in a state out East." An engineer who was working as an expert witness needed to show that the failure of some materials at a nuclear utility plant was the fault of structural engineers, and for some reason those class schedules would help him make his case.

In an animated account of her long-distance sleuthing, Rubens tells how she finally located the schedules, only to find them locked in some library stacks thousands of miles away. Undaunted by barriers, Rubens then found a librarian willing to bend the rules a bit and release them. The librarian, it seems, had once studied in Wisconsin and was delighted to do a favor for a friendly voice from the Midwest.

As coordinator of the Engineering, Science, and Technology Information Service (ESTIS), Rubens gets information off library shelves and into the hands of people who need it. Rubens and her staff of three students retrieve information for clients from the IT library or anywhere else in the world, for that matter, and they'll do it fast.

A service of the Institute of Technology Libraries for the business community, ESTIS helps fulfill the University's land-grant mission, Rubens says.

"We are supporting technology transfer and economic development," she says. "It's very clear that one of the keys to technology is transferring the information from the research literature to a business, where they can use the information to create and sell products." ESTIS does that, Rubens says. "It's an effort to bring the University community and the business community together."

Not all requests are for information as far-flung as those class schedules; 70 percent of requests are filled from the IT library, within easy reach of the ESTIS staff.

The IT library, which has been housed in Walter Library on the University campus since 1985, contains more than 400,000 volumes on physics, chemistry, engineering, computer science, geology, general science, mathematics, and architecture. The library subscribes to 4,500 journals and has a vast collection of bound journals. The bound journals alone occupy 8,500 linear feet of shelving on each of four stack levels (about six and a half miles of shelf space).

ESTIS' users include high-technology companies, lawyers involved in liability cases, patent attorneys, product developers, marketing professionals, managers, and consultants—"people who for one reason or another need technical information," Rubens says.

"A library is basically a do-it-yourself kind of operation. The library is open. People come in, and they can do research," she says. But ESTIS clients don't have time to do the research themselves, so they pay ESTIS to provide personalized service. ESTIS staff will track down books and journal articles, make photocopies, and do literature searches and research.

The document delivery service is the biggest part of ESTIS' business. Most documents are delivered within 24 to 48 hours, but ESTIS also offers a 60-minute rush service.

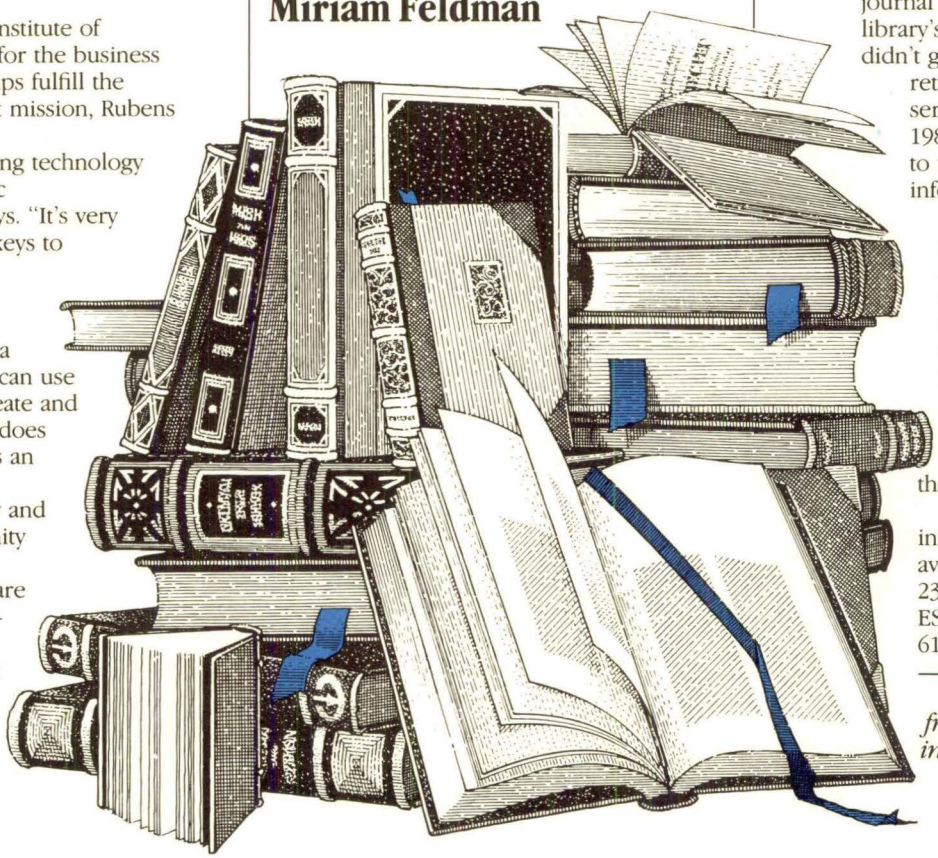
Information not available in the IT collection comes from a variety of sources Rubens has carefully culled including the American Society for Metals; the Engineering Societies Library in New York; the British Lending Library; and libraries at Georgia Tech, the University of Michigan, and the University of Wisconsin.

Tracking down documents outside of the IT collection intrigues Rubens, who enjoys the challenge of laying her hands on an obscure document under the pressure of a deadline. Sometimes, she says, the trick isn't finding the information, but (as in the case of the class schedules) retrieving it.

ESTIS is relatively new, having evolved out of what Rubens calls "a mom-and-pop operation," which formerly operated out of the old engineering library in Lind Hall. "It was a sort of incidental service," in which the librarians filled requests for copies of journal articles found in the library's collection. However, they didn't go outside the library to retrieve information. That service wasn't added until June 1986, when Rubens was hired to turn ESTIS into a full-scale information retrieval service.

In the past year, the number of ESTIS clients has doubled, from 300 to 600, and Rubens would like to serve many more than that. She especially wants to reach IT alumni. "I believe they ought to know this is here, and the University is doing something for them," she says.

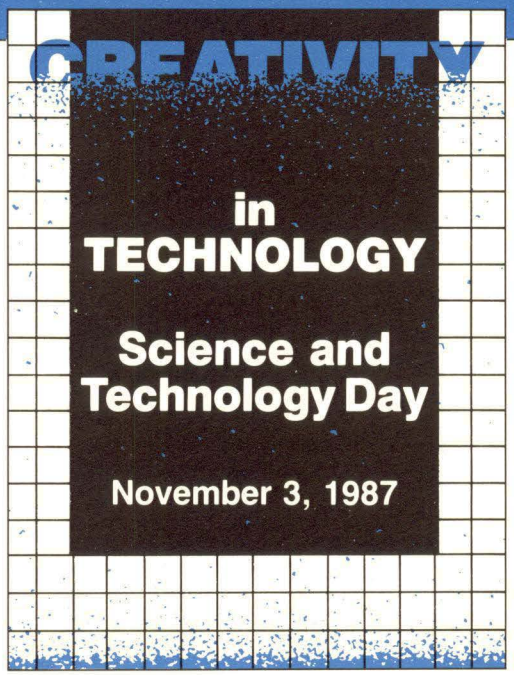
A price list and other information about ESTIS are available by calling 612/624-2356 or 612/624-0224. The ESTIS telefacsimile number is 612/624-8518. I



Miriam Feldman is a free-lance writer living in Minneapolis.

Food, Fun, Free Parking Featured at 1987 Science and Technology Day

IT Alumni Society meeting set for Nov. 3



There's a huge party in the works for Institute of Technology alumni.

On Nov. 3, hundreds of alumni and corporate friends will gather for Science and Technology Day 1987. The annual meeting will take on a new look at International Market Square's atrium near downtown Minneapolis.

"We have chosen a setting and speaker that should be festive and entertaining," says Tom Rusch, secretary/treasurer for the Institute of Technology Alumni Society (ITAS). John Rollwagen, chairman and CEO of Cray Research Inc., is the keynote speaker. He will talk about the role people play in technology.

Science and Technology Day is ITAS' main fund-raising event. Last year, more than 70 Twin Cities corporations and corporate divisions sponsored tables (see list below) for the evening banquet, which raised almost $10,000 to fund scholarships and support alumni activities.

Rusch encourages alumni to vote early (Nov. 3 is election day) and come to the Science and Technology Day feast. For information or to reserve a spot (who wants to miss a good party?), call Ann Streitz Christensen at the Minnesota Alumni Association, 612/624-2323. I

Volunteers, Please Apply

In addition to attending Science and Technology Day 1987, interested alumni and friends can help further to make the event successful. Volunteers are needed on Nov. 3 to assist with registration and displays. If you can help, please contact Ann Streitz Christensen at the Minnesota Alumni Association, 612/624-2323. I

List of 1986 S & T Day corporate sponsors

ADC Telecommunications
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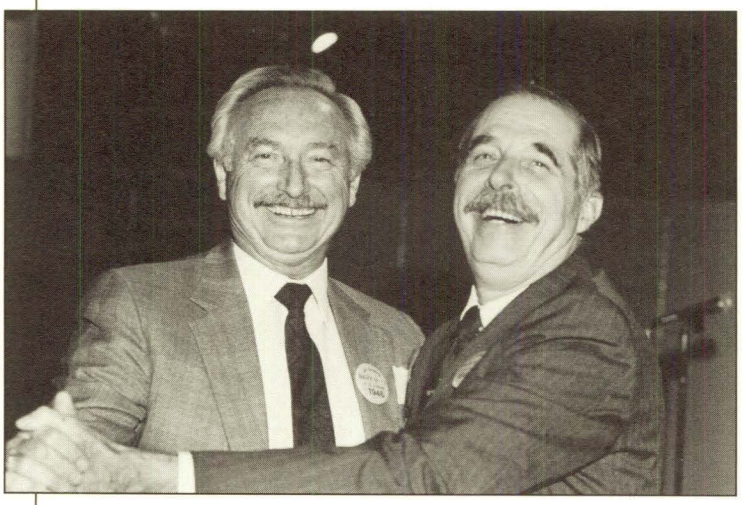
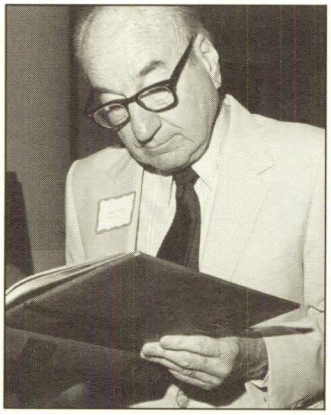
REUNIONS





Old friends, new stories

The classes of 1936, 1946, Navy V12 1946, and 1936 School of Mines celebrated reunions in 1986. During their 50-year reunion held in June, School of Mines alumni toured the Civil and Mineral Engineering Building and enjoyed dinner together. In October, the classes of 1936, 1946, and Navy V12 1946 held their reunion during homecoming. *Top Left* Smile guys—Jack Sherman (left) and Eugene Covert, Navy V12 alums. *Middle Left* Going up—Jack Sherman, Leonard Sturm, Arthur Fletcher (back), Bernard Jurek, and Eileen Jurek (front). *Middle right* '36 grad Warner Blake checks out a *Gopher* yearbook. *Top Right* Dinner festivities for the October reunions were held at International Market Square near downtown Minneapolis. *Middle Right* V12 1946 class members: back row (from left to right) Leonard Sturm, Gordon Jones, Harold Bowen, Graham Davis, James Biba, Robert Anderson, Henry Basil, Bernard Jurek, George Petre, William Burbach, William Brown, Charles Michaelis; front row (from left to right) Arthur Fletcher, Eugene Covert, John Heising, Harry Johnsen, David Day, John Sherman. *Bottom Left* 1936 School of Mines class members: back row (from left to right) John Mahle, Michael Tenenbaum, Michael Tierney, Eugene Stein, John Lynn, Hugh Leach; front row (from left to right) Len Mayeron, Bert Andreas, Ed Leach, Leonard Rice, Homer Anderson, Charles Sampson, Sherman Pease (for stories by alums, see pages 7-8).

Photos by Mary Perkins

ALUMNI

1938

William R. Sears *(Aerospace)* received an honorary doctor of science degree from the University of Arizona in May 1987. He also delivered the Lester D. Gardner Lecture at the Massachusetts Institute of Technology in May.

1948

Frank P. Vinella *(Mechanical)* is president of Terrazzo Machine & Supply Co. Inc., Minneapolis, member of the American Society of Mechanical Engineering (ASME), and chair of the Minnesota ASME.

1956

George A. Champine *(Physics, 1975 Ph.D.)* teaches graphics and directs Project Athena at the Massachusetts Institute of Technology for Digital Equipment Corp.

1958

Bernard Jacob *(Architecture)* has been appointed to a four-year term on the State Designer Selection Board, which helps the state select architects, engineers, and landscape architects for state projects. acob maintains his own rchitectural practice in owntown Minneapolis.

Richard J. Hartmann *(Electrical)*, president of Arjay Sales Inc., Minneapolis, has received the Distinguished Society Service Award from the Instrument Society of America recognizing his 18 years of service to the organization.

1971

Damon Farber *(Architecture)*, president of Damon Farber Associates/Landscape Architects in Minneapolis, has been appointed to the State Designer Selection Board.

1972

Michael Overcash *(Chemical, Ph.D.)* has been invited to the People's Republic of China to consult on modern municipal waste treatment technologies that may prevent high infant mortality.

1977

Jeffrey Harvey *(Math, Physics)*, assistant professor at Princeton University, has won a Presidential Young Investigator grant.

1978

Stephen O. Hay *(Chemistry)*, who completed his Ph.D. in chemical physics at the University of Southern California in 1985, is an associate research engineer in optical physics for United Technologies Research Center in Hartford, Conn.

1979

John W. Swanson *(Mechanical)* works as a process maintenance engineer for 3M Co. in magnetic media manufacturing of audio, video, and computer media.

1980

David G. Wick *(Electrical)* has been named bipolar product line manager, responsible for product marketing and new product definition, at Honeywell's digital product center in Colorado Springs, Colo.

1982

Captain Steve Ditmer *(Civil and Mineral)*, who received his master's degree in engineering management from the Air Force Institute of Technology in 1986, is now a staff officer at the Offutt AFB Strategic Air Command Headquarters.

1983

Michael Beaupre *(Civil and Mineral, 1986 Computer)* is an engineer programmer for the U.S. Army Corps of Engineers. In June, he married Elizabeth Stuck, a Ph.D. student in computer science.

Eric L. Hagen *(Aerospace)* is a senior design engineer at Lockheed Aircraft Service Company in Ontario, Calif. He provides support to the maintenance and modification of C-130 and P-3 aircraft.

1984

LTJG Michael Kane *(Electrical)* is engineer officer on the U.S.S. Mobile.

1985

Douglas Quigley *(Mechanical)* is a design and development engineer with Chrysler Corporation in Highland Park, Mich. He married Jane Schroedl in 1986.

Steven Schroedl *(Geo Engineering)* is a geo scientist/licensing engineer at Science Applications International Corporation in Las Vegas, Nev.

1986

Randy Ahlm *(Mechanical)* is an associate engineer for Frito-Lay in Detroit, Mich. I

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Other News

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DEATHS

Robert Brasted

In October 1986, chemisty professor emeritus Robert Brasted died at the age of 71. Recollections of Stuart Fenton, chemistry professor emeritus, follow:

Our thoughts about Bob must be happy ones—few have set themselves such difficult goals, and fewer have achieved them.

Bob's work took him to nearly every part of the globe; he had an insatiable desire to help. No part of his experience seemed to be wasted. He searched for relevance, and it was a foundation of his teaching.

He had friends everywhere.

On a national level, Bob was active in the affairs of the American Chemical Society and was in the first wave of those engaged in retreading high school and college chemistry. He helped to create and participated actively in many of the post-Sputnik, pre-Vietnam institutes set up to improve instruction in mathematics and the sciences.

At home in Minnesota, he headed our general chemistry program for over 20 years. His contributions were far more than administrative: During his years at the University, he taught more than 50,000 students. We knew Bob's effectiveness as a teacher, and he was recognized as a leader in his profession. He received more than 15 awards for his efforts, including the American Chemical Society Award in Education, the Chemical Manufacturers Award, the James Flack Norris award of the American Chemical Society's Northeast Section, Alpha Chi Sigma's John Kuebler Award, and was the first recipient of the Carol and Henry Mosher Award. Bob was the only person honored with all five of these awards.

A Robert C. Brasted Memorial Undergraduate Fellowship and Teaching Apprenticeship has been established by faculty and staff. To contribute, please contact the chemistry department at 612/624-6000. I

Richard Hammel

Richard Hammel was cofounder and principal architect of the distinguished architectural and engineering firm, Hammel Green & Abrahamson. A tribute from architecture professor Roger Clemence follows:

Dick Hammel's commitment to architecture and to education played a central role in his professional life. A member of both IT's Advisory Council and the SALA Advisory Board, Dick was always creative and supportive in his recommendations for improving the growth experiences of student architects. His firm has been one of the most receptive in the state to hiring students as part-time employees, and no office has a better record of promoting young architects to leadership than HGA.

A former assistant advisory architect here at the University, a faculty member during the early 1950s, and the 1984 president of the Minnesota Society of the American Institute of Architects, Dick Hammel never lost his concern for people and their personal growth, even as his firm expanded from its initial two-person partnership to the second largest architectural practice in Minnesota. His death at age 63 is a great loss to all who have been touched by his kindness, his talent, and his humor. Yet, in his many commitments to excellence, we can all find a legacy that will live for generations. I

H.W. (Hal) Fridlund *(Architecture 1930)*, 80, former *Minnesota Daily* editor, founder and former editor of *Northwest Architect* magazine, and founder of H.W. Fridlund Architects in Minneapolis.

Robert D. Hanson *(Architecture 1949)*, 60, head of Matrix Associates in St. Louis Park. An Army Air Corps pilot during World War II, he received the Distinguished Flying Cross and 15 air medals.

Edwin Kelm *(School of Mines 1933)*, 78, formerly a chartered life underwriter for Mutual of New York Insurance Company. He served in the Army from 1943 to 1946.

Thomas R. Klingel *(Civil and Mineral 1937)*, 71, associate professor of civil engineering at the University from 1948 to 1951 and former Soo Line chief engineer and executive vice president.

Alexander S. Levens *(Math 1922)*, 86, professor emeritus at the University of California at Berkeley. He consulted for Boeing, Consolidated, and Douglas Aircraft during World War II and published an annual math book used in schools throughout California.

Lynn Dell Peeler *(Mechanical 1957)*, quality assurance engineer with Westinghouse Electric Corp. for 29 years.

Arthur Schwantes, 90, former agricultural engineering professor and department head at the University. He was an engineering adviser to the Egyptian government in 1952, president of the American Society of Agricultural Engineers in 1948-49, and a member of the board of directors of the National Safety Council, whose farm committee honored him with an outstanding service award in 1958. I

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